I. Amendments to the Claims

This listing of claims replaces without prejudice all prior versions and listings of claims in the application:

Listing of Claims:

Claims 1-85 (cancelled)

86. (New) A minimum tillage apparatus, comprising:

a frame having at least three transverse frame members disposed substantially perpendicular to a direction of travel of said apparatus;

a plurality of walking axles coupled to said frame, each walking axle comprising two wheels, at least a first one of said three transverse frame members being disposed forward of said walking axles in said direction of travel, and at least a second one of said three transverse frame members being disposed rearward of said walking axles in said direction of travel;

a first plurality of mounting structures coupled to said first one of said three transverse members;

a second plurality of mounting structures coupled to said second one of said three transverse members, each one of said second plurality of mounting structures being staggered in said direction of travel with respect to said first plurality of mounting structures;

a third plurality of mounting structures coupled to a third one of said three transverse members, each one of said third plurality of mounting structures being staggered in

said direction of travel with respect to said first plurality of mounting structures or with respect to said second plurality of mounting structures;

each mounting structure being configured to be movably fixable to different locations on the corresponding transverse member, each mounting structure comprising (i) a hollow strut portion, (ii) a bracket portion configured to couple said hollow strut portion to the corresponding transverse member, (iii) a substantially horizontal slot configured to permit rotation of a corresponding upper shank about a vertical axis by plus or minus 30 degrees with respect to said direction of travel, (iv) at least one bushing disposed within said hollow strut portion and configured to support said corresponding upper shank, and (v) a support member configured to limit upward movement of said corresponding upper shank;

a plurality of coil springs, each mounted to a corresponding mounting structure and comprising (i) an upper shank configured to fit within a corresponding hollow strut portion, (ii) a coil portion, and (iii) a lower shank portion angled away from said direction of travel with respect to the corresponding upper shank portion, each upper shank, coil portion, and lower shank being configured such that when said lower shank biases upward, the corresponding coil tightens, substantially half of the coil portions being wound in the clockwise direction, and substantially the other half of the coil portions being wound in the counter clockwise direction;

a plurality of coulter wheels, each coupled to a corresponding one of said lower shanks, each mounting structure supporting a single coulter wheel;

a plurality of tines mounted at a rear of said frame and configured to be staggered in said direction of travel with respect to at least one of the pluralities of mounting structures; and

a plurality of rolling harrows coupled to said frame behind said plurality of tines in said direction of travel.

87. (New) The minimum tillage implement according to claim 86, wherein each coil spring comprises a rotatable hub configured for coupling a single coulter wheel to the lower shank.

88. (New) The minimum tillage implement according to claim 86, wherein the coil portion comprises a horizontal spring axis.

89. (New) The minimum tillage implement according to claim 88, wherein the lower shank is permitted to deflect upwardly about the horizontal spring axis in response to impact with an obstacle.

90. (New) The minimum tillage implement according to claim 86, wherein each upper shank has a horizontal hole therethrough and is secured within the hollow strut by means of a horizontal pin extending through the slots and the hole, thereby permitting rotational movement of the shank within the hollow strut about the vertical axis.

91. (New) The minimum tillage implement according to claim 86, wherein the frame comprises four or more longitudinally spaced apart transverse frame members and wherein the implement further comprises a fourth plurality of mounting structures coupled to a fourth one of said four or more transverse frame members, said fourth one of said transverse frame

members disposed on an opposite side of said walking axles relative to said third one of said transverse frame members, said fourth plurality of mounting structures being staggered in said direction of travel with respect to said third plurality of mounting structures and with respect to either said first or said second plurality of mounting structures.

92. (New) The minimum tillage implement according to claim 86, wherein each coil portion on a left side of the implement is wound counter-clockwise, and each coil portion on a right side of the implement is wound clockwise.

93. (New) The minimum tillage implement according to claim 86, further comprising adjustment structure configured to cause each coulter wheel to penetrate no further than one inch into the soil.

94. (New) The minimum tillage implement according to claim 93, wherein said adjustment structure is configured to adjust both (i) a height of said frame and (ii) a tilt of said frame with respect to a horizontal axis passing through said walking axles.

95. (New) The minimum tillage implement according to claim 94, further comprising additional adjustment structure configured to adjust a height of said rolling harrow.

96. (New) The minimum tillage implement according to claim 86, wherein said frame comprises a central portion and two wing portions, and further comprising hydraulic lifting structure configured to lift said two wing portions relative to said central portion.

97. (New) A minimum tillage implement comprising:

a frame comprising: (i) a plurality of longitudinal frame members, (ii) at least three transverse frame members, (iii) a central portion with two sides, (iv) a wing portion hingedly attached to each side of said central portion, each wing portion having a corresponding hydraulic cylinder mounted to the central portion and said each wing portion, the hydraulic cylinder operable to pivot the two wing portions from a horizontal ground-working orientation to a vertical-transport orientation upon actuation of the hydraulic cylinder, and (v) the central portion further comprising a tongue adapted for connection to a drawbar of a tractor, the tongue attached to the central portion at a tongue hinge and supported by means of a tongue constraint that is configured to be extensible in order to affect a desired angular relationship between the tongue and the frame to adjust the frame at a desired working depth of the implement;

at least two sets of wheels respectively disposed on opposite sides of the central portion beneath the frame, at least a first one of the three transverse frame members being disposed forward of the wheels in a longitudinal direction of travel, and at least a second one of the three transverse frame members being disposed rearward of the wheels in the direction of travel at least two of the transverse frame members ahead of the wheels and at least two of the transverse frame members rearward of the wheels, each set of wheels comprising a first wheel and a second wheel that are longitudinally spaced apart and laterally staggered relative to one another an configured to reduce plugging between the wheels, each wheel rotatably connected to a longitudinal axle mounting member that is pivotally attached to a lever arm at a pivot point that is located between the first and second wheels in order to permit the wheels to pivot about the

pivot point in response to impact with obstacles, the lever arm pivotally attached to the frame, a hydraulic wheel cylinder pivotally connected the frame and configured to be extensible to alter an angular relationship between the lever arm and the frame in order to adjust a height of the frame at the desired working depth of the implement;

at least three rows of a plurality of laterally-adjustable, removably-mounted, individual coulter wheel assemblies, a coulter wheel assembly in a given row being laterally spaced apart from the remaining coulter wheel assemblies in that row and laterally staggered with respect to the coulter wheels assemblies in a longitudinally adjacent row and configured to reduce plugging between the coulter wheel assemblies, each coulter wheel assembly comprising a coil spring with a horizontal spring axis and upper and lower shank ends extending tangentially therefrom, the lower shank end angled downwardly and rearwardly of the implement and comprising a rotatable hub to which is mounted a single substantially disc shaped coulter wheel adapted for ground penetration;

at least two left side coulter wheel assemblies and at least two right side coulter wheel assemblies, the coil spring of the left side coulter wheel assemblies wound counter-clockwise, the coil spring of the right side coulter wheel assemblies wound clockwise, the springs configured to tighten and thereby bias the coulter wheels downwardly in response to upward movement of the coulter wheels in response to impact with obstacles;

the upper shanks of the left side and right side coulter wheel assemblies extending substantially vertically upwardly and including a horizontal hole therethrough, each of the upper shanks received within a corresponding individual mounting structure comprising a vertically extending hollow strut having a pair of opposed horizontal slots therethrough, each slot having two ends, the upper shanks secured within the hollow struts by means of a pin extending through

the slots and the hole to thereby permit rotational movement of the shanks within the struts about a vertical axis concentric with the struts in response to directional changes of the implement, the slots being sized such that rotational movement of the coulter wheel assembly within the strut is limited to +/-30 degrees relative to a longitudinal direction by engagement of the pin with the ends of the slot, the hollow strut further comprising an upper cap for engagement with an uppermost end of the upper shank, the mounting structure further comprising clamping means for removably securing the mounting structure to the transverse frame member so that the mounting structure is removable and laterally adjustable on the transverse frame members, each mounting structure supporting a single coulter wheel assembly; and

a set of spike harrows and a set of rolling harrows pivotally attached at a rear of the frame.

98. (New) The minimum tillage implement according to claim 97, wherein the lower shank is permitted to deflect upwardly about the horizontal spring axis in response to impact with an obstacle.

99. (New) The minimum tillage implement according to claim 97, wherein the frame comprises four or more longitudinally spaced apart transverse frame members and four or more rows of a plurality of laterally-adjustable removably-mounted individual coulter wheel assemblies, a row corresponding to each transverse frame member, a fourth one of the four transverse frame members disposed on an opposite side of the wheels relative to a third one of the transverse frame members.

100. (New) The minimum tillage implement according to claim 97, wherein there are a substantially equal number of left side coulter wheel assemblies and right side coulter wheel assemblies.

101. (New) The minimum tillage implement according to claim 97, further comprising adjustment structure configured to cause each coulter wheel to penetrate no further than one inch into the soil.

102. (New) The minimum tillage implement according to claim 101, wherein said adjustment structure is configured to adjust both (i) a height of said frame and (ii) a tilt of said frame with respect to a horizontal axis passing through said at least two sets of wheels.

103. (New) The minimum tillage implement according to claim 102, further comprising additional adjustment structure configured to adjust a height of said rolling harrow.